SE868V2 EVK User Manual

1VV03001091 Rev.0 – 2013-09-19

Making machines talk.

APPLICABILITY TABLE

PRODUCT
SE868V2

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1. Introduction

1.1. Scope

Scope of this document is to give an overview of the Evaluation kit of the GPS standalone module SE868V2.

1.2. Audience

This document is intended for customers who are evaluating one or more products in the applicability table.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit Technical Support Center (TTSC) at:

Alternatively, use:

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

To register for product news and announcements or for product questions contact Telit Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

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1.4. Text Conventions

Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.

Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.

Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.5. Related Documents

- SE868V2 HW User Guide,
- SE868V2 Product Descritption,

NOTE:

- To prevent ESD and EOS damage, a properly grounded ESD wrist strap should be worn when working inside the EVK.
- Do not alter switch positions while USB power is applied.
- Do not short the RF signal to ground if the antenna voltage is installed. Damage to the EVK may result.

NOTE:

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Always follow ESD safety precautions when utilizing the SE868V2 evaluation kit. For additional information on the SE868V2, ask your sales representative for additional manuals, datasheets, support, etc.

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2. Preparing for the SE868V2

What is Necessary

To use the SE868V2 Evaluation kit, you will need:

- FTDI USB Drivers
- SiRFLive2.0 and above or
- A PC with a USB port that fulfills the minimum software requirements:
    - Windows XP/7
    - .NET Framework 2.0
        - This will be automatically installed by the SiRFLive package if necessary (internet connection is required).
- A SE868V2 evaluation device.

2.1. Installing the USB Drivers

Before connecting the SE868V2 Evaluation Kit, install the necessary USB drivers.

1 Double-click the USB driver executable and follow the directions to install the USB drivers.

2.2. Installing SiRFLive

NOTE SiRFLive does not work on 64-bit OS machine at this time!
Minimum PC requirements:

- Pentium CPU 2 GHz
- 1 GB of RAM
- 100 MB hard drive

Recommended

- 2 GB of RAM
- 1280 x 1024 screen resolution

Ensure that all previous installation versions of SiRFLive have been uninstalled before installing any newer versions!

Install the current SiRFLive with the attached installer. Follow the installer directions until finished. Users should allow SiRFLive to install to the default location – C:\Program Files\SiRF\SiRFLive, but it can be changed if necessary.

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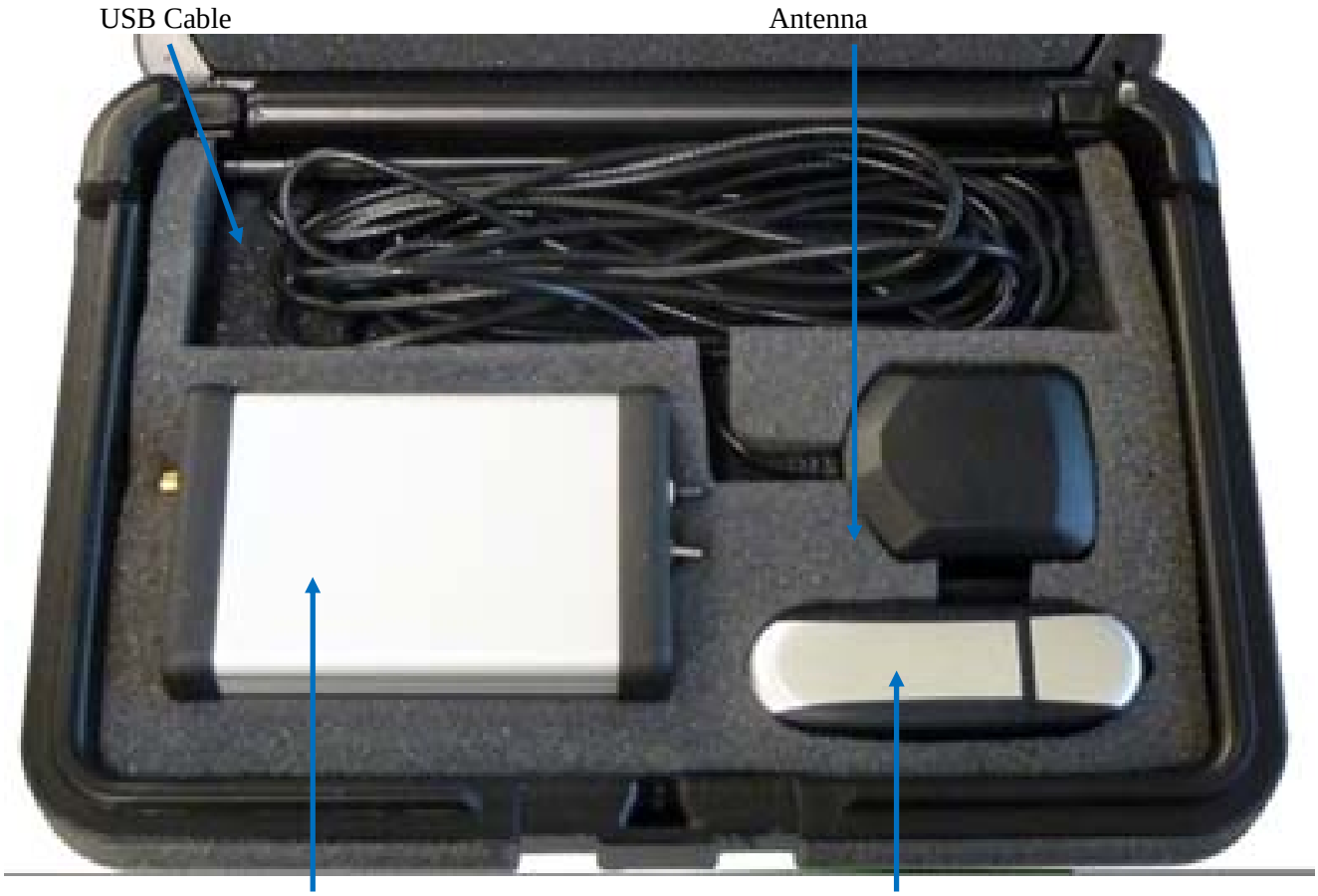
3. SE868V2 Evaluation Kit

3.1. What's in the Box



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3.2. SE868V2 Evaluation Board

TX LED 1PPS LED Module ON LED Battery Backup

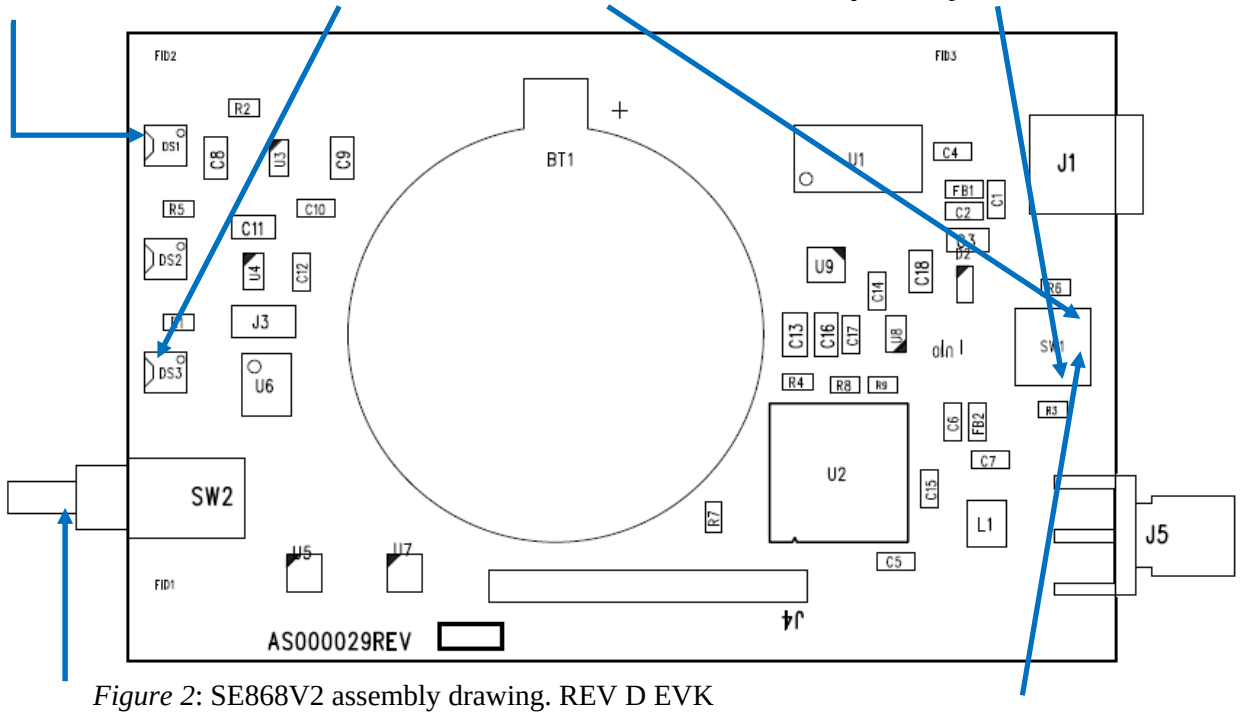

Figure 2: SE868V2 assembly drawing. REV D EVK

ON_OFF Pulse 3.3V Antenna Supply

Item	Function
TX LED	LED that is tied to the USB to UART bridge TX line. The LED blinks whenever there is activity on the TX line.
1PPS LED	LED that pulses ON at ¼ a second and OFF at ¾ a second, indicating a fix with the receiver.
Module ON LED	LED indicating that the module is on. LED is tied to the SYSTEM_ON pin out of the SE868V2.
ON_OFF Pulse	Pushbutton that sends a 1.8V voltage pulse to the ON_OFF input of the SE868V2module.
3.3V Antenna Supply	2 of SW1 pressed down provides a 3.3V output to an active antenna (depress if connecting a passive antenna).
Battery Backup Pin	4 of SW1 pressed down will utilize a 3V lithium battery installed on BT1. Refer to Section 5 on how to properly utilize a battery with the SE868V2.

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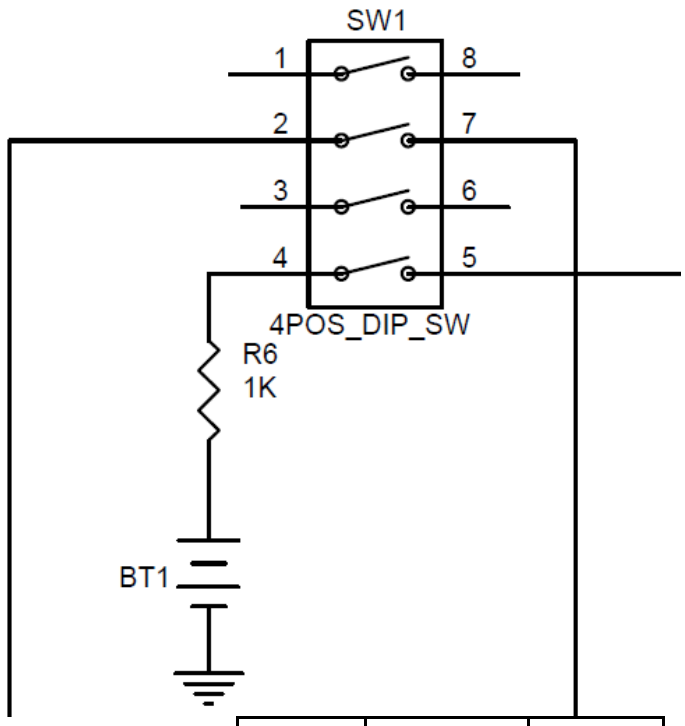
3.2.1. Switch Configuration



	1	2	4
Normal GPS	(BOOT)	(Active Ant)	(Battery)
w/ provided Active Antenna no Battery	NO	YES	NO
w/ Passive Antenna no Battery	NO	NO	NO
w/ Active Antenna and Battery	NO	YES	YES
w/ Passive Antenna and Battery	NO	NO	YES
	NA	NA	NA

For Dip SW1

4. Step-by-Step: First Time Running the SE868V2 Evaluation Board

The SE868V2 evaluation board defaults to *hibernate mode* as soon as the USB is connected. It is important to understand the different power states in order to be in the correct mode for the desired operation.

4.1. Step-by-Step: First Time Connection

1. Before connecting the evaluation board, ensure that the USB drivers have been installed.
2. As soon as the evaluation board is connected to the PC, it will be detected and installed.

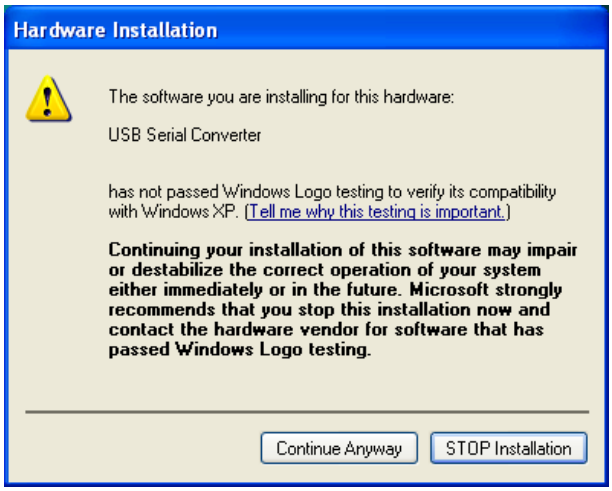

Hardware Installation
The software you are installing for this hardware:
USB Serial Converter
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

Figure 3: USB installation, select “Continue Anyway” to proceed.

3. After the evaluation board has been installed, check the “Device Manager” window for the evaluation board COM port number. This information is needed for use with the GPS tools.

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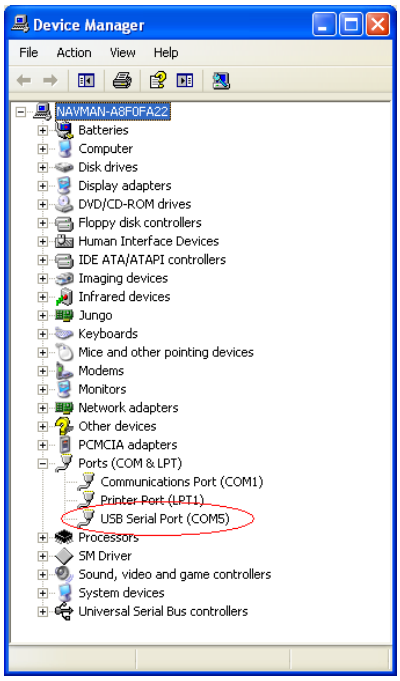

Figure 4: In this case, the COM port is assigned as COM5

1. At first application of power (connecting of USB), the evaluation board should default to *hibernate mode*. The **Module ON LED** should be unlit.
2. Press the **ON/OFF** pulse button to bring the unit into *Full Power Mode*.
3. The *Full Power Mode* will be indicated by the **Module ON LED**.
4. Connect the provided GPS Active Antenna. NOTE: The evaluation kit is outputting 3.3V to the antenna. For a passive antenna, position 2 of SW1 needs to be depressed.
5. Place the GPS Active Antenna to where it has a clear view of open sky.
6. The evaluation board can now be manipulated with the provided GPS tools (SiRFLive or SiRFDemo).
7. Refer to Chapter 4: SE868V2on SiRFLive for using the SE868V2 on SiRFLive.

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5. SE868V2 on SiRFLive

Launch the SiRFLive application.

5.1. Main Interface

After launching SiRFLive, first notice the application's main interface.

Figure 5: Main Menu Bar

Figure 6: Main Tool Bar

5.2. Connecting To the SE868V2

The user can utilize either the *Main Menu Bar* or the *Main Tool Bar*.

5.2.1. Main Menu Bar

Under the option "Receiver" on the *Main Menu Bar*, there is a selection "Connect. . ." This will open the Receiver settings for connection.

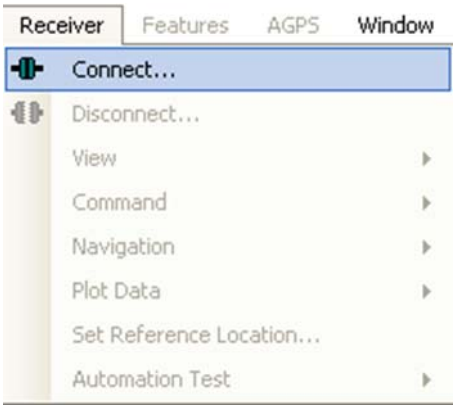

Figure 7: Connect to Receiver

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5.2.2. Main Tool Bar

Select the “Receiver Settings” button

Or the “Connect” button

5.2.3. Rx Port Settings

Select the GSD5xp Product Family, RS232/USB, and the Correct COM Port.

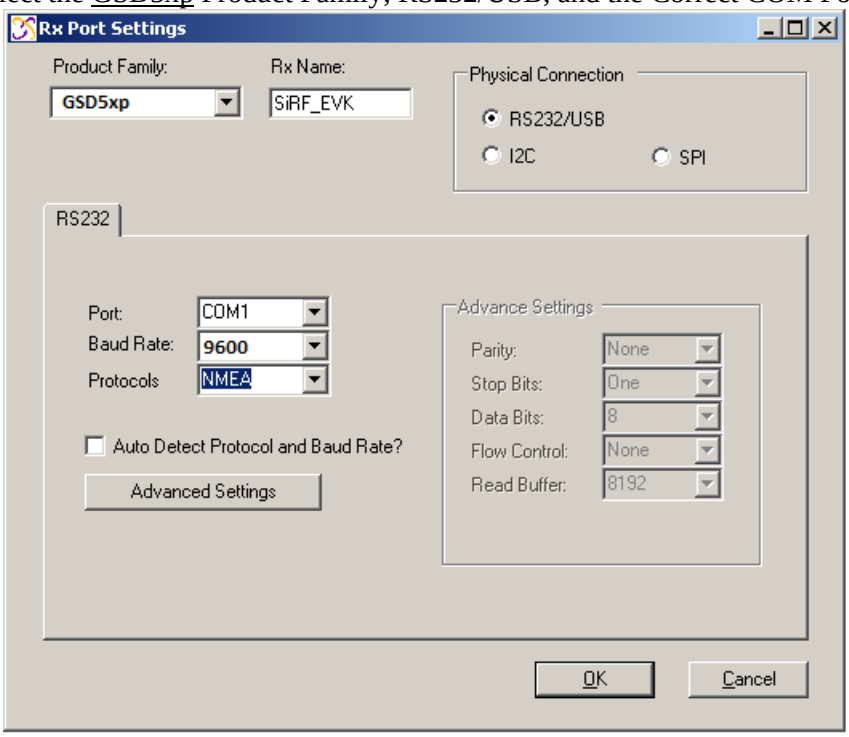

Figure 8: The Rx Port Connection Window

Default Baud rate for NMEA is 9600, and 115200 for OSP.

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5.3. SiRFLive Windows

After a successful connection with the receiver is established, the default SiRFLive windows should be arranged and become filled with data.

If not all the default windows are arranged or opened, under the *Main Menu Bar*, go to "Window" > "Restore Layout" > "Default."

5.3.1. Signal View

(main tool bar icon)

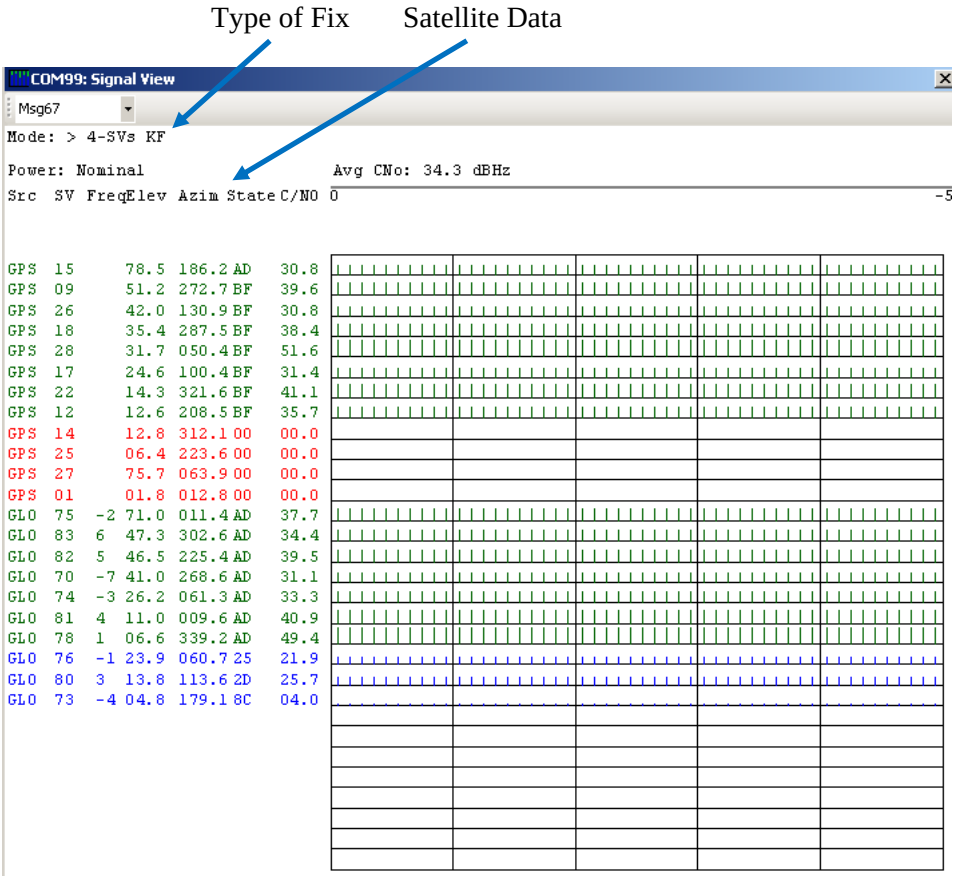

Figure 9 Shows the satellite signal levels.

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5.3.2. Radar View

(main tool bar icon)

Red satellites – 0 C/N0
Blue satellites – nonzero C/N0 but not being used in the navigation solution
Green satellites – nonzero C/N0 and are being used in the navigation solution
Skyblue satellites – SBAS satellites
Orange satellites – ABP is being used to acquire satellites
Magenta satellites – Extended Ephemeris is being used to acquire satellites.

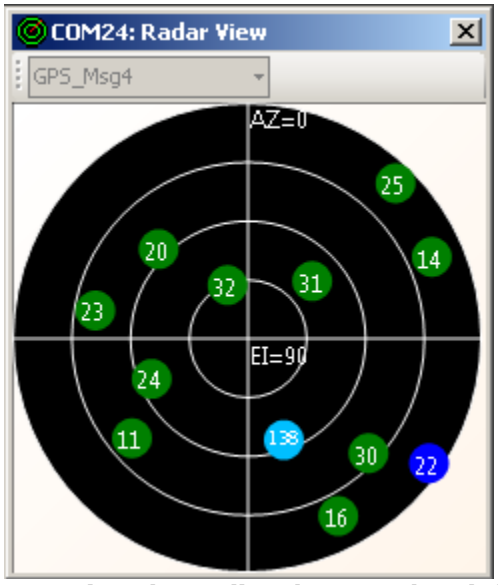

Figure 10: Displays the satellites by azimuth and elevation.

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5.3.3. Debug View

(main tool bar icon)

Shows the communication messages with the receiver.

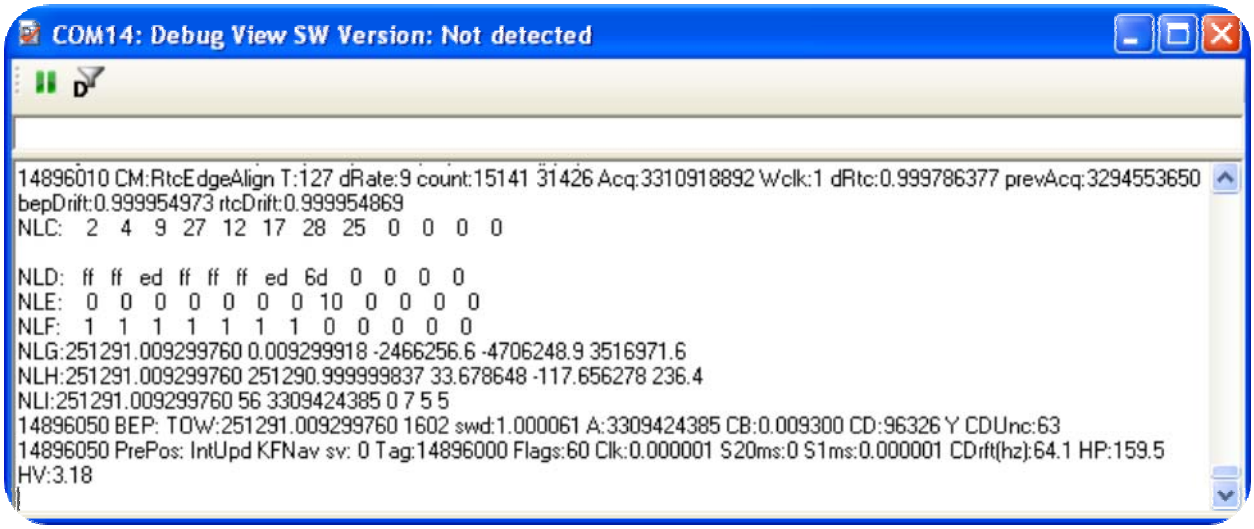

Figure 11: Debug view with One Socket Protocol messages.

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5.3.4. Location View

(main tool bar icon)

Displays more detailed information regarding the UTC, TOW, Latitude, Longitude, Altitude, etc.

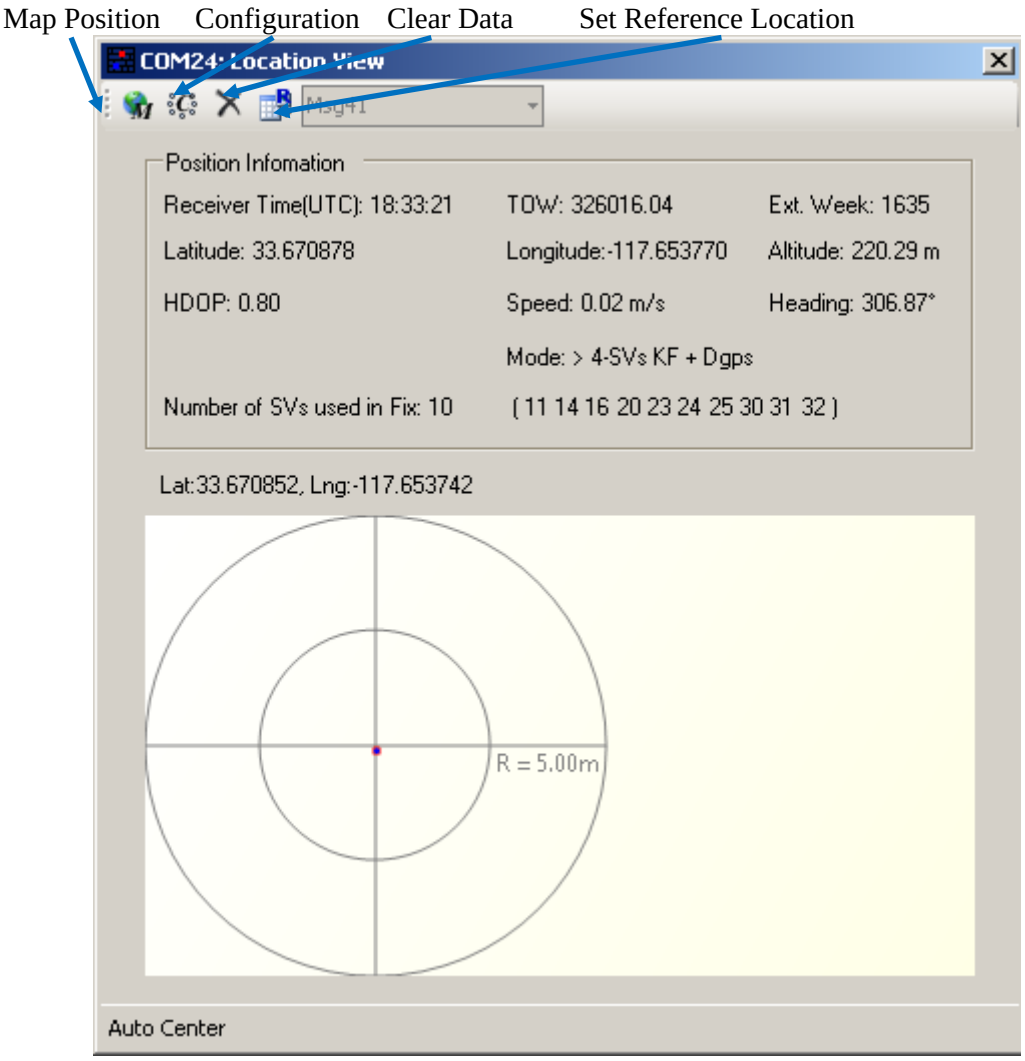

Figure 12: Location view

Map position button requires Internet access to work.

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5.4. Receiver Commands

Most of the Receiver Commands can be accessed through the *Main Menu Bar* under "Receiver" > "Command." There are also shortcuts on the *Main Tool Bar* which will be covered in this section.

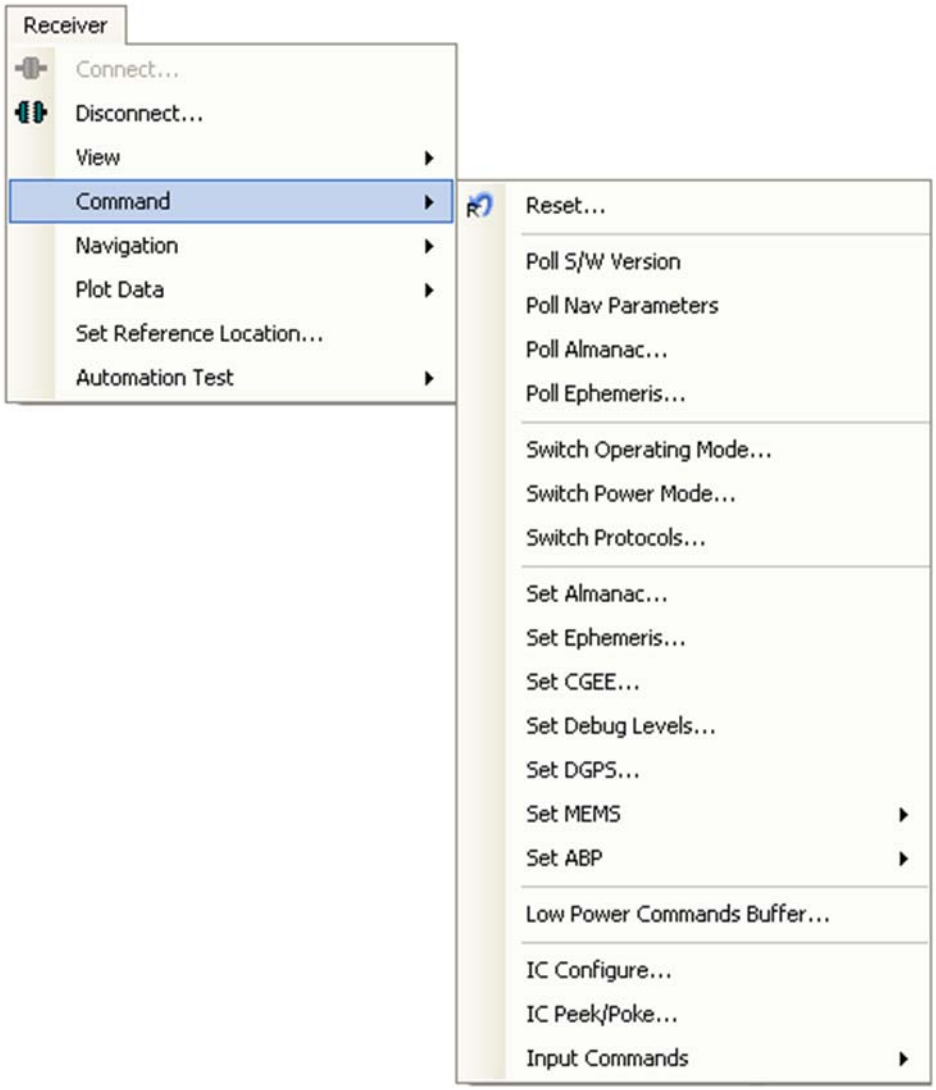

Figure 13: All the commands for the receiver.

All of the *Receiver Commands* become available in One Socket Protocol (OSP) only.

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5.4.1. Sending Resets

(main tool bar icon)

1. Select “Reset. . .” under the *Main Menu Bar* “Receiver” > “Command” > “Reset. . .”
   Or
   Select the Reset icon on the *Main Tool Bar*.

The “Reset” window should open.
Reference Location allows the user to change the position used as the reference. This helps determine position accuracy in conjunction with Time-To-First-Fix values.

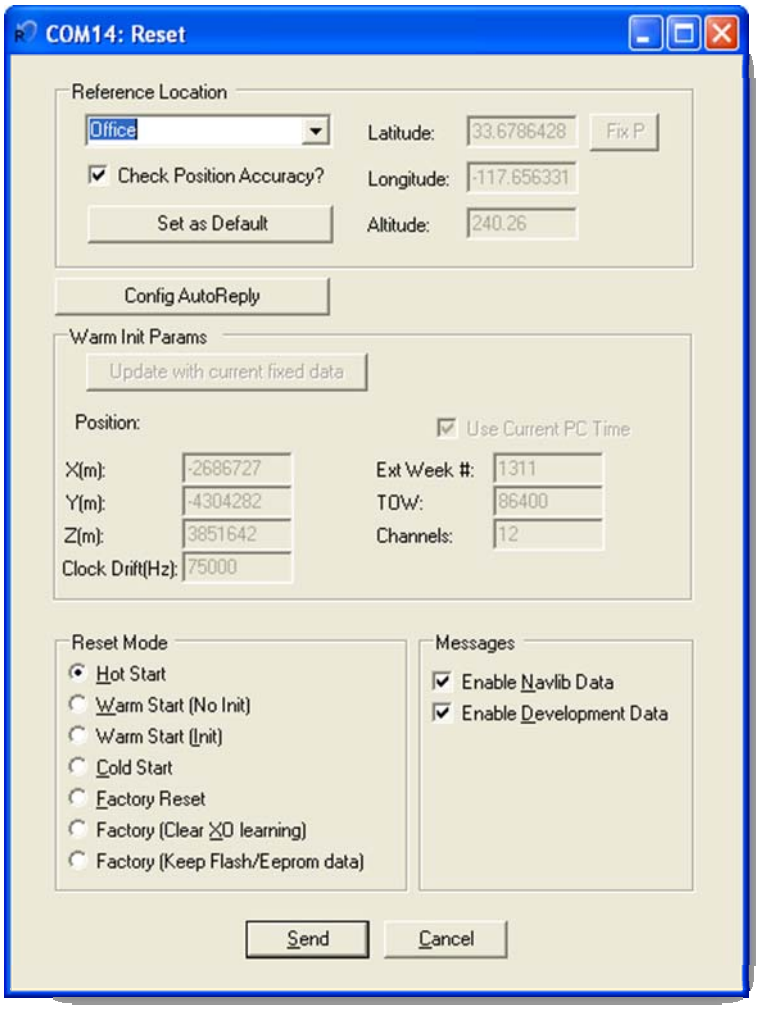

Figure 14: Reset window.

Resets are used to measure the TTFF of the receiver. The TTFF/Nav Accuracy window conveniently displays the TTFF in seconds and Navigation accuracy based on the Reference Location.

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5.4.2. Switch Protocol

The number of available commands in NMEA is limited compared to OSP. Switching to OSP for testing is recommended.

1. On the *Main Menu Bar*, select “Receiver” > “Command” > “Switch Protocols. . .”

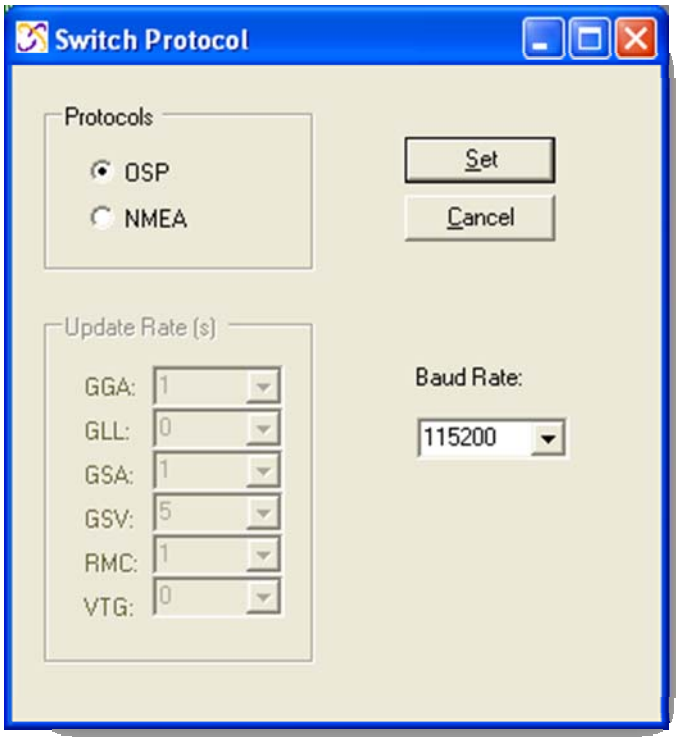

Figure 15: Switching to OSP protocol with its default 115200 baud rate

2. Click “Set” to apply settings.

Switching to NMEA should be similar.

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5.4.3. Setting the IC Configuration

The SE868V2 module has two LNA modes, a high gain mode, and a low gain mode. The high gain mode is ideal for passive antenna applications, while the low gain mode is ideal for active antenna applications.

LNA Gain Setting	Gain (dB)	Noise Figure (dB)	Recommended External Gain Range
Low	6.0–10.0	8.5–9.5	16–30
High	16.0–20.0	1.2–2.0	8–18

Table 1: LNA information and antenna gain requirements

The development kit hardware is set up to use an active antenna. The antenna feed is outputting 3.3V for the antenna. To ensure that no cross-correlation occurs, ensure that the correct LNA gain setting is selected for the chosen GPS antenna for use. In this case, the provided GPS antenna has a 16dB typical gain. The SE868V2 automatically sets the LNA to low gain mode. To verify the IC config

1. On the *Main Menu Bar*, select “Receiver” > “Command” > “IC Configure. . .”

2. Click on “Advanced. . .” to open the IC Configuration fields.

A message will pop up warning about incorrectly configuring the IC parameters. Ensure that you are aware of the correct parameter changes so as not to render your receiver non-operational.

i. Click “Yes” to proceed.
ii. Under the selection “LNA Gain Mode:” verify the LNA is in low gain. For passive antenna or simulator use the LNA gain should be set for high gain. *Figure 16* displays the IC Configuration window.

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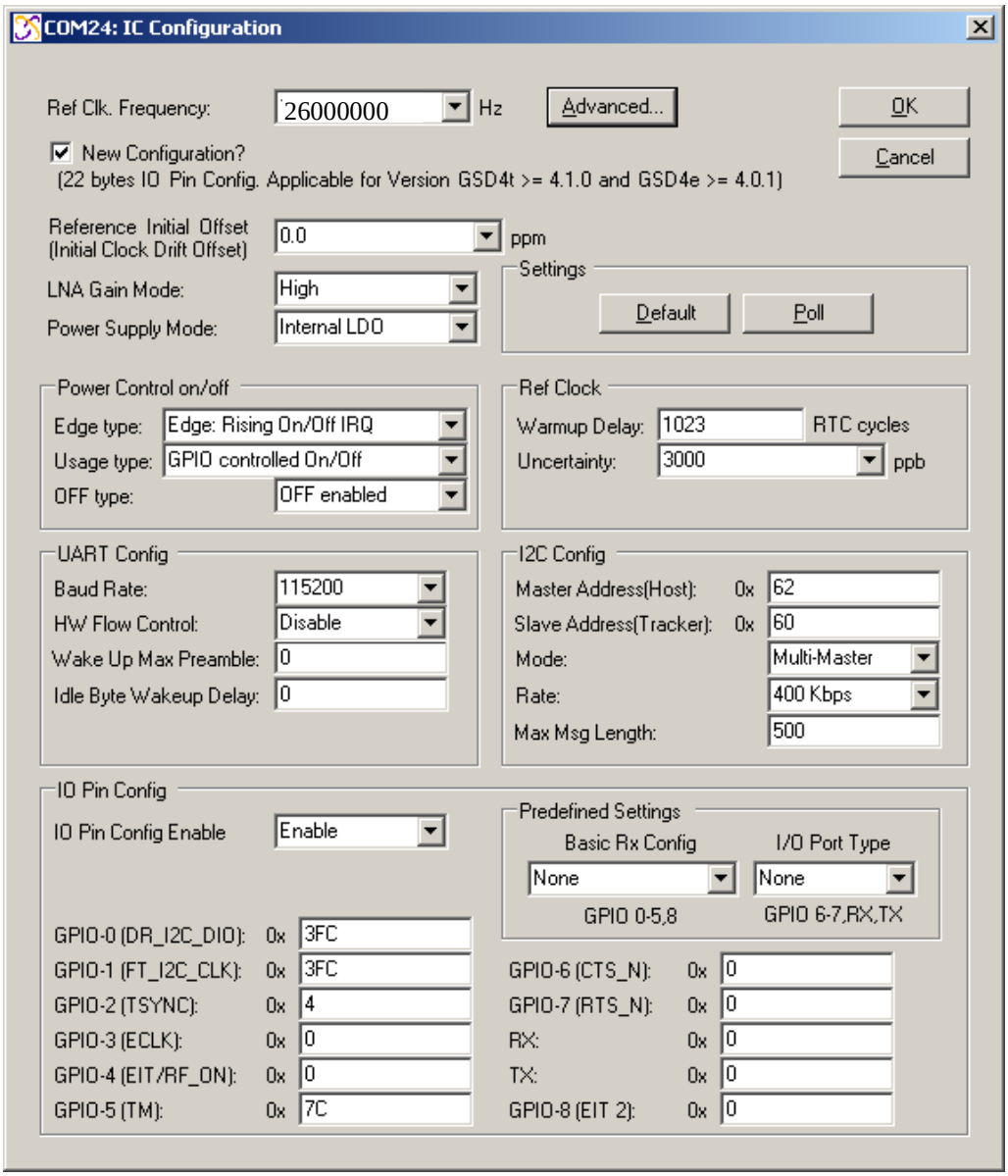

Figure 16: Configuring the IC parameters.

1. Click "OK" after all necessary changes.

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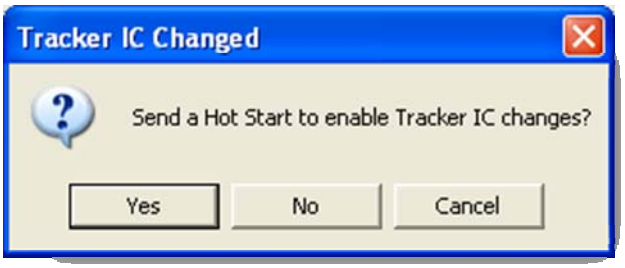

Figure 17: Click "Yes" in order for new changes to be applied.

5.4.4. Logging Data

(main tool bar icon)
SiRFLive is capable of collecting either the OSP message stream or the NMEA message stream into a log file.

1. While the receiver is outputting messages to SiRFLive, click on the *Log File* icon on the *Main Tool Bar* or go through the *Main Menu Bar* under "Log File" then "Start. . ." shown in Fig 18.

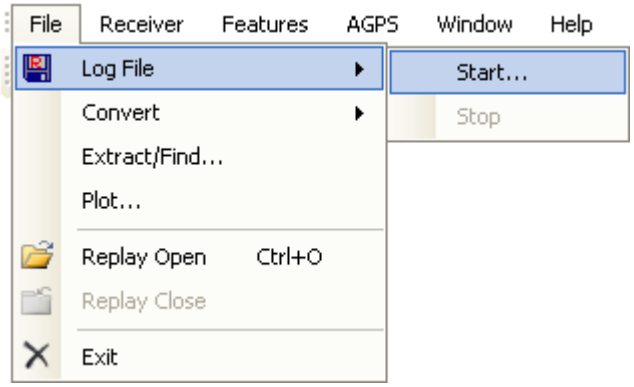

Fig 18: *Main Menu Bar* access to the Log File command.

i. The *Log File* window should open, which is shown in Fig 19. Click on the ". . ." button, as indicated by the arrow in Fig 19, to open a window where the user can specify the output folder and the output file name.

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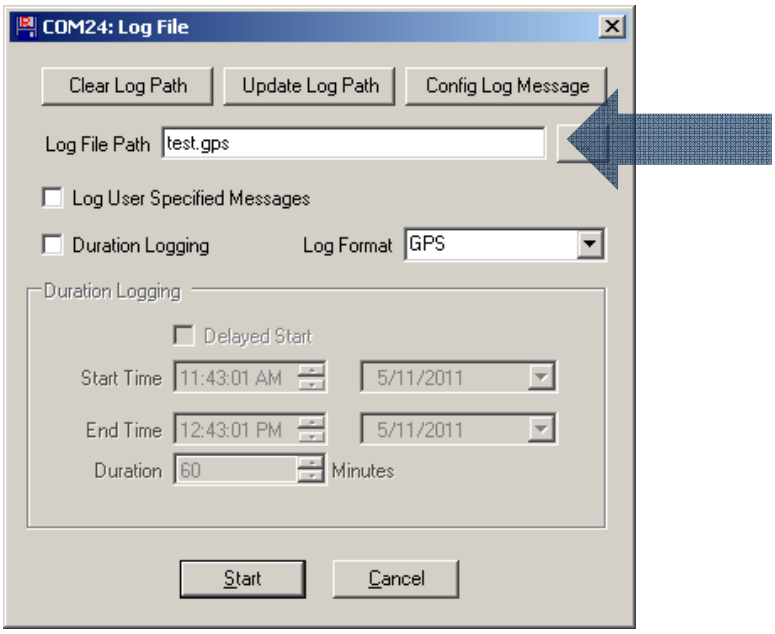

Fig 19: Clicking on the ". . ." button will give the user the control of the output folder and output name

ii. After specifying the output folder and output name, close the "Specify log file name:" window by clicking *Open* and the "Log File Path:" bar should be filled with the file path. Select the desired Log Format, and click "Start" in order to start logging.

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6. Battery Function on SE868V2

The SE868V2 evaluation kit supports the use of battery backup. If the 3V lithium coin cell is installed, and position 4 of SW1 is pressed (Battery Backup) then the evaluation kit will support battery backup. However, the procedure must adhere to the instructions below
To safely enter battery backup:

1. While the evaluation kit is running, press the **ON_OFF Pulse** pushbutton. The **Module ON LED** should turn off.
2. Once the **Module ON LED** turns off, the USB cable can be removed. The SE868V2 will retain RTC time and battery backed memory.

If this procedure is not followed, the current limiting resistor on the backup battery will cause the supply voltage to sage enough that RTC time and battery backed RAM is lost.

Note that if the battery is not installed, the evaluation kit will still support hibernate mode with preserved battery backed RAM and RTC. The connected USB cable will be providing the *hibernate* voltage in this case.

To safely exit battery backup:

1. While the evaluation kit is in *hibernate* mode, connect the USB cable to the computer. Wait until the computer enumerates the USB port and applies power.
2. Press the **ON_OFF Pulse** button.

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7. 5Hz Funbction on SE868V2

7.1. NMEA Messages

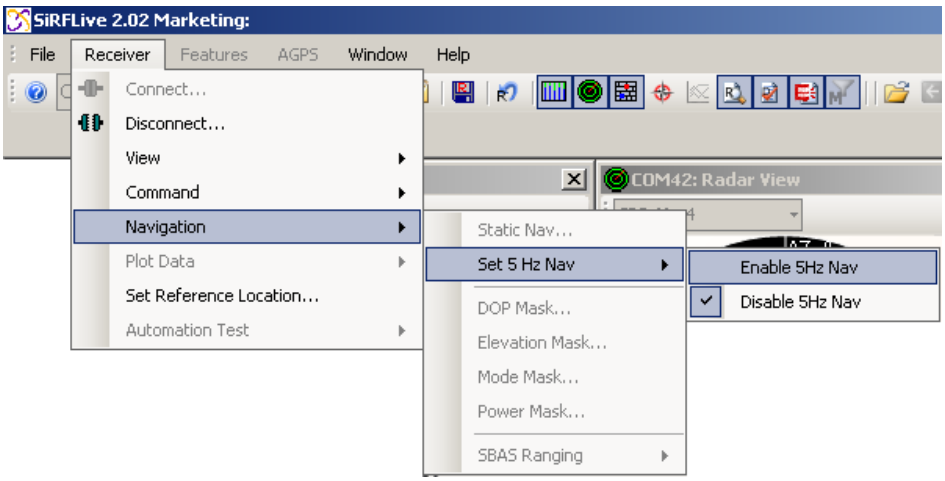
The SE868V2 default protocol is NMEA v3.0 at 9600 baud. The following messages are the default NMEA messages outputted by the SE868V2:

- RMC = 1 second update
- GGA = 1 second update
- GSA = 1 second update
- GSV = 5 second update

7.1.1. Enable 5Hz Update NMEA

Through SiRFLive, access the *Main Menu Bar*, under “Receiver” > “Navigation” > “Set 5Hz Nav” select “Enable 5Hz Nav.”

Note that for 5Hz update rate in NMEA mode, the receiver baud rate needs to be at least 38400 with all default NMEA messages On.



The “Enable 5Hz Nav” command in SiRFLive sends the following:
$PSRF103,00,6,00,0*23
The “Disable 5Hz Nav” command in SiRFLive sends the following:
$PSRF103,00,7,00,0*22

At the new 5Hz update rate, the default NMEA messages are output accordingly:

- RMC = 0.2 second update
- GGA = 0.2 second update
- GSA = 0.2 second update
- GSV = 1 second update

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7.2. One Socket Protocol (OSP) Messages

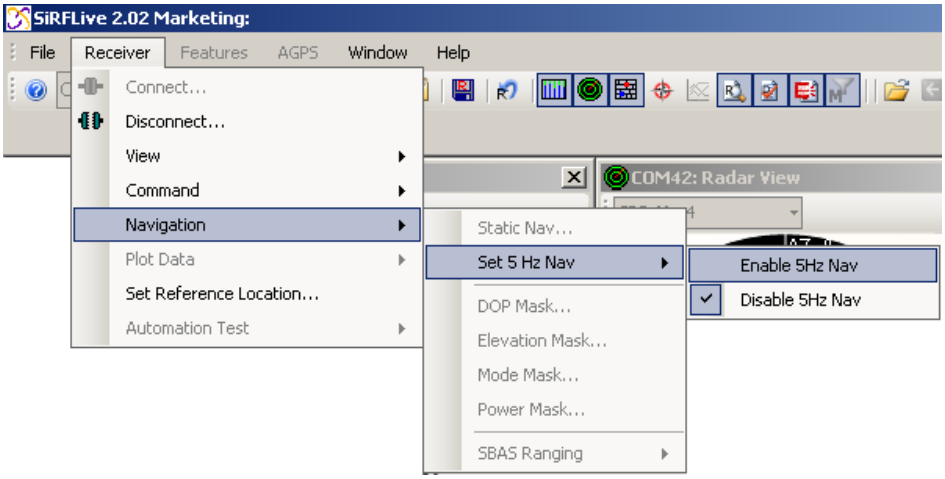
SiRF One Socket Protocol (OSP) is supported. This is an extension of the existing SiRF Binary protocol. The following messages are output once per second:

- MID 2
- MID 3
- MID 4
- MID 7
- MID 9
- MID 41
- MID 64 SUB ID 2 (One message for each satellite being tracked).
- MID 138

7.2.1. Enable 5Hz Update OSP

Through SiRFLive, access the *Main Menu Bar*, under “Receiver” > “Navigation” > “Set 5Hz Nav” select “Enable 5Hz Nav.”

Note that for 5Hz update rate in OSP mode, the receiver baud rate needs to be at least 57600 with all default OSP messages On.



The “Enable 5Hz Nav” command in SiRFLive sends the following:
A0 A2 00 0E 88 00 00 04 04 00 00 00 00 00 00 00 0F 02 00 A1 B0 B3
The “Disable 5Hz Nav” command in SiRFLive sends the following:
A0 A2 00 0E 88 00 00 04 00 00 00 00 00 00 00 00 0F 02 00 9D B0 B3

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7.2.2. MID 136 – Mode Control

Name	Bytes	Binary (Hex)		Unit	Description
		Scale	Example		
Message ID	1 U		88		Decimal 136
Reserved	2 U		0000		Reserved
Degraded Mode	1 U		01		Controls use of 2-SV and 1-SV solutions
Position Calc Mode	1 U		01		xxxx xxx0 = ABP, OFF xxxx xxx1 = ABP, ON xxxx xx0x = Reverse EE OFF xxxx xx1x = Reverse EE ON xxxx x0xx = 5Hz nav update OFF xxxx x1xx = 5Hz nav update ON xxxx 0xxx = SBAS Ranging use OFF xxxx 1xxx = SBAS Ranging use ON
Reserved	1 U		00		Reserved
Altitude	2 S		0000	meters	User specified altitude, range - 1,000 to 10,000
Alt Hold Mode	1 U		00		Controls use of 3-SV solution
Alt Hold Source	1 U		00		0 = Use last computed altitude 1 = User user-input altitude
Reserved	1 U		00		Reserved
Degraded Time Out	1 U		05	sec	0 = disable degraded mode, 1 to 120 seconds degraded mode time limit
DR Time Out	1 U		02	sec	0 = disable dead reckoning, 1 to 120 seconds dead reckoning mode time limit
Measurement and Track Smoothing	1 U		00000011		xxxxxxx0 = disable track smoothing xxxxxxx1 = enable track smoothing xxxxxx0x = use raw measurements xxxxxx1x = use smooth measurements

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8. APPENDIX

8.1. Updating Patch Code

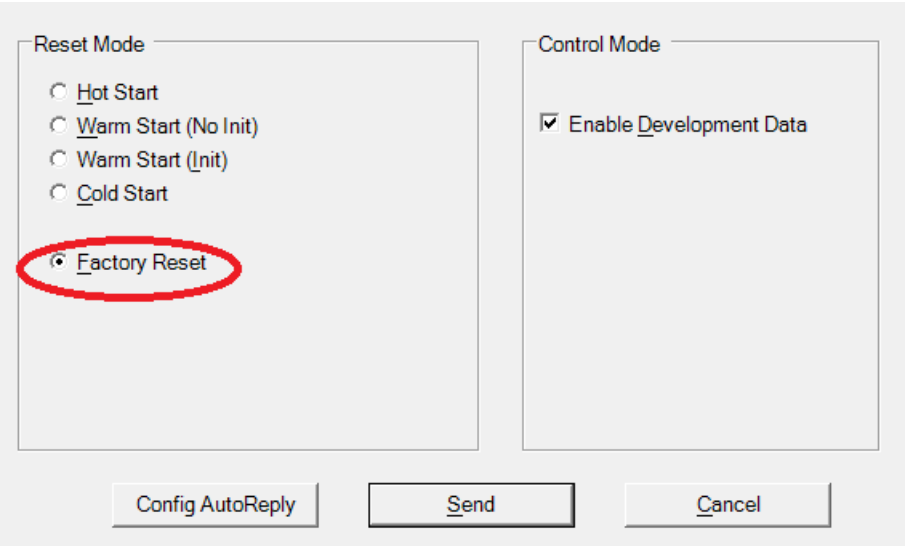
The following step-by-step instruction should be used to upload new Patch code to the SE868V2 device.

Equipment

1. Computer
2. USB connector
3. Download RomPatch App tool
4. Device

Procedure

1. Prior to re-flashing the device, you must first issue a factory reset.
2. Open SiRFLive
3. Connect the device by clicking icon select comport, baud rate and protocol or check the box titled Auto Detect.
4. Click OK
5. Once the device is connected click on icon to send the factory rest.
6. Select the reset that is circled in red below and press send.



7. Disconnect and close SiRFLive tool.
8. Open the SSV Patch 5.5.21.zip folder located in the tools directory of the USB Flash Drive provided with the EVK kit.

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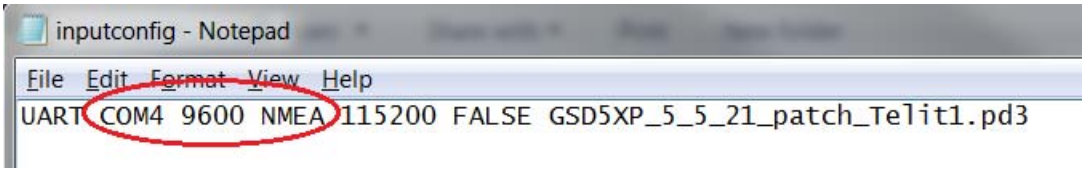
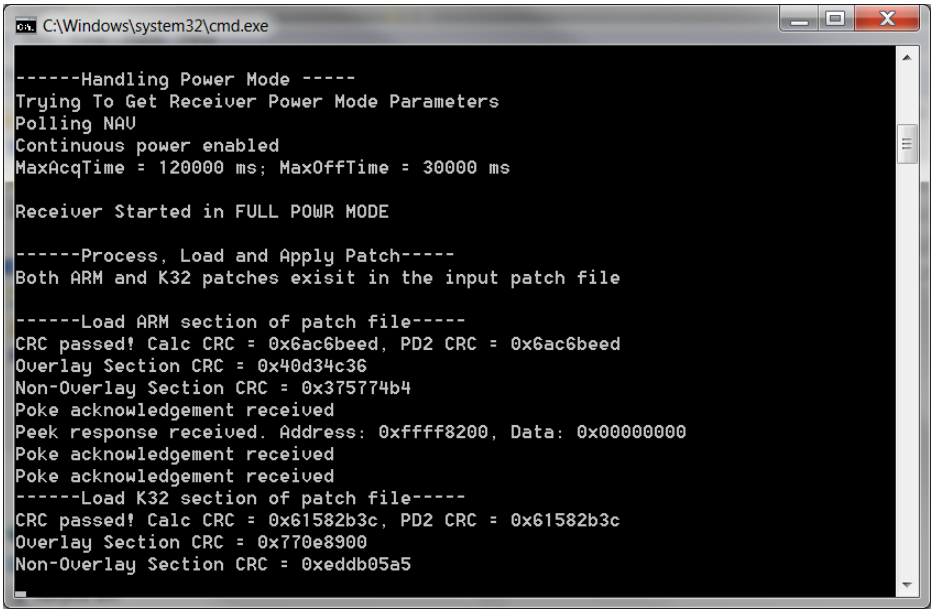
9. Save the “SSV Patch 5.5.21” folder to your desktop.
10. Open “SSV Patch 5.5.21” folder.
11. Open the The Input Config File (inputconfig.txt) and updated the com port, protocol and baud rate for your device. You can check the devices Com port and baud rate by connecting it to SiRFLive tool and run auto detect. Make sure to close the SiRFLive application before proceeding to the next step, to release the com port for reflashing the device.



Shown in the picture above are the contents of the input Config file. The items circled in red need to match your device com port and baud rate settings.

12. Save the inputconfig.txt file.
13. Double click on the Patch 8 batch file to start the patch upload. You should see the following window displayed.


C:\Windows\system32\cmd.exe
------Handling Power Mode -----
Trying To Get Receiver Power Mode Parameters
Polling NAV
Continuous power enabled
MaxAcqTime = 120000 ms; MaxOffTime = 30000 ms
Receiver Started in FULL POWR MODE
------Process, Load and Apply Patch-----
Both ARM and K32 patches exisit in the input patch file
------Load ARM section of patch file-----
CRC passed! Calc CRC = 0x6ac6beed, PD2 CRC = 0x6ac6beed
Overlay Section CRC = 0x40d34c36
Non-Overlay Section CRC = 0x375774b4
Poke acknowledgement received
Peek response received. Address: 0xffff8200, Data: 0x00000000
Poke acknowledgement received
Poke acknowledgement received
------Load K32 section of patch file-----
CRC passed! Calc CRC = 0x61582b3c, PD2 CRC = 0x61582b3c
Overlay Section CRC = 0x770e8900
Non-Overlay Section CRC = 0xeddb05a5

14. Verify the patch code has been updated using SiRFLive by opening the tab titled “Receiver”. Scroll down to “Command”, and over to Poll… then click on “Poll S/W Version”.

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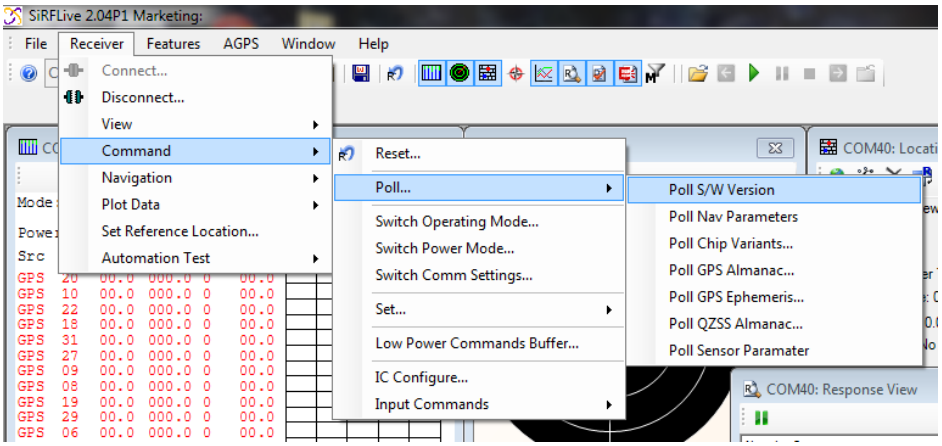

15. The Software version should appear in response view window.
    5xp__5.5.21-R32+5xpt_5.5.21-R32
    SA-Telit1
16. If the correct software version is shown the device is successfully updated and is ready for use.
17. If another software version is displayed, issue a factory reset to the device and repeat steps 3-8. Make sure all steps are followed during retry.

8.2.

Do not send a FACTORY RESET after the device is programmed correctly. This will clear the patch code and require reprogramming.

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8.3. Going into Hibernate Mode

The SE868V2Evaluation Board's main power comes from its USB port. Upon connection to a USB port, the evaluation kit defaults to its *hibernate mode*.

Hibernate mode is an ultra low power state that has both the RF and baseband turned off, leaving only the RTC and battery-backed RAM powered.

8.3.1. Going into Full Power Mode

1. From hibernate mode (Module ON LED off), Wake up the SE868V2module by pressing the **ON_OFF Pulse** pushbutton once.
2. Wait for the **Module ON LED** to turn on, indicating that the module has left *hibernate mode*.
3. It is now ready to communicate with software GPS tools.

8.4. Internal LNA and Antenna

The Internal LNA has two modes, each are specific to the amount of gain that a connected antenna will have.

Usually, in high gain internal LNA mode, the antenna connected will be a passive antenna, while the low gain internal LNA mode will require an active antenna or an external LNA.
It is recommended for the AGC to be in mid-range(between 1 and 32). If the total system gain is too high, the AGC will be high, therefore it will not be able to compensate as well if the receiver is in a noisy environment.
The SE868V2evaluation is bundled with an Active Antenna, providing an amplifier gain of 16dB typical.

8.4.1. Active Antenna

The bundled M820B antenna requires a DC voltage between 2.7V to 6.0V. The Evaluation Kit can provide 3.3V to the active antenna by pressing position 2 of SW1. The active antenna should be low gain variety.

For passive antenna connection, ensure that position 2 of SW1 is depressed in order to prevent damage.

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8.4.2. Passive Antenna

Open the box and ensure that position 2 of SW1 is depressed.

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9. Document History

Revision	Date	Changes
0	2013-09-19	First issue

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